[redacted] US Rec'd PCT/PTO 25 JAN 2002

*FORM PTO-1390
OFFICE
(REV 11-2000)

U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. § 371

ATTORNEY'S DOCKET NUMBER: 449122014700

U S APPLICATION NO (If known, see 37 CFR 1 5): 10/031986 Not yet assigned

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/02429	July 18, 2000	July 27,1999

TITLE OF INVENTION

ENERGY-SAVING DEVICE FOR A RAIL VEHICLE

APPLICANT(S) FOR DO/EO/US

Torsten BAIER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U S C 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S C 371.
3. ☐ This is an express request to begin national examination procedures (35 U S C 371(f)) The submission must include items (5), (6), (9) and (21) indicated below
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application under PCT Article 19 (35 U S C 371(c)(2))
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U S C 371(c)(3)).
   a. ☐ are attached hereto (required only if not communicated by the International Bureau)
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U S C 371(c)(3))
9. ☒ An oath or declaration of the inventor(s) (35 U S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5))

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment
15. ☐ A substitute specification
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter 2 and 35 U S C 1 821 - 1.825.
18. ☐ A second copy of the published international application under 35 U S C 154(d)(4)
19. ☐ A second copy of the English language translation of the international application under 35 U.S C 154(d)(4)
20. ☒ Other items or information 1) Application Data Sheet; 2)Int'l Search Report; 3) IPER; 4) Return receipt postcard.

CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on January 25, 2002.

Melissa Garton

Melissa Garton

dc-296784

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY DOCKET NO
Not yet assigned 10/031986	PCT/DE00/02429	449122014700

21. ☒ The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO.....$1,000.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO.....$890.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provision of PCT Article 33(1)-(4).....$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4).....$100.00

	CALCULATIONS PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$0	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	- 20 =		x $18.00	$0	
Independent claims	- 3 =		x $80.00	$0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	$0	

TOTAL OF ABOVE CALCULATIONS =	$890.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.	$0	
SUBTOTAL =	$0	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +	$0	
TOTAL NATIONAL FEE =	$0	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 per property** +	$40.00	
TOTAL FEES ENCLOSED =	$930.00	
	Amount to be refunded:	**$**
	charged:	**$**

a. ☒ Please charge my **Deposit Account No. 03-1952** (referencing Docket No. 449122014700) in the amount of $930.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

b. ☒ The Commissioner is hereby authorized to charge any additional fees that may be required, or credit any overpayment to **Deposit Account No. 03-1952** (referencing Docket No. 449122014700).

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Kevin R. Spivak
Morrison & Foerster LLP
2000 Pennsylvania Avenue, N.W.
Washington, D.C. 20006-1888

SIGNATURE

Kevin R. Spivak
Registration No. 43,148

January 25, 2002

CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on July 31, 2002.

Emily T. Palmer

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Torsten BAIER

Serial No.: 10/031,986

Filing Date: January 25, 2002

For: ENERGY-SAVING DEVICE FOR A RAIL VEHICLE

Examiner: Not yet assigned

Group Art Unit: Not yet assigned

PRELIMINARY AMENDMENT

BOX PCT
Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend this application as follows:

In the Specification:

Page 1 before the first paragraph, please delete the following:

Description

Page 1, between lines 4 and 5, please insert the following headings and paragraph:

CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/02429 which was published in the German language on July 18, 2000.

TECHNICAL FIELD OF THE INVENTION

Please replace the paragraph beginning at line 5 of page 1 with the following rewritten paragraph:

The invention relates to a device for a rail vehicle, and in particular, to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the next stopping point.

Page 1, between lines 28 and 29, please insert the following heading:

BACKGROUND OF THE INVENTION

Please replace the consecutive paragraphs beginning at line 29 of page 1 with the following rewritten paragraphs:

A device, described in US patent 5,239,472, is used to save travel energy on rail vehicles. This device has, as a control unit, a microprocessor which determines the distance between the rail vehicle and the next stopping point with a location measured value which is sensed by an odometer and with route data which is stored in storage means.

Furthermore, the microprocessor determines, with a measured time measured value which indicates the respective time, and with a predefined, stored timetable, the travel time remaining to the rail vehicle until it reaches the next stopping point. With the distance value and the remaining travel time, the microprocessor then calculates, while taking into account the respective travel speed and the coasting behavior of the rail vehicle, the point in time (referred to below as deactivation time) starting from which the rail vehicle can reach the next stopping point in non-driven fashion (i.e., by coasting or braking), while complying with the timetable.

An output device in the form of a display device is connected to the control unit. The display device is actuated by the control unit such that displaying the term "coast" signals a time which the drive of the rail vehicle can be switched off. In the device, the route data and the predefined timetable are transmitted to the rail vehicle by a track-mounted computing unit

before the rail vehicle is put into operation, and are permanently stored in said computing unit. The device is therefore an energy-saving device which saves energy by determining at what time the next stopping point can be reached in accordance with a timetable, and places the rail vehicle in a non-driven mode by utilizing the respective kinetic energy of the rail vehicle.

Page 2, between lines 29 and 30, please insert the following headings and paragraphs:

SUMMARY OF THE INVENTION

In one embodiment of the invention, there is a device of a rail vehicle. The device includes, for example, a computing unit which determines, in the rail vehicle, the distance between the rail vehicle and a stopping point using a measured location measuring value that specifies a location of the rail vehicle and predefined, stored route data travel time remaining to the stopping point using a measured time measuring value which specifies the time and a predefined stored timetable, and a deactivation time in the rail vehicle based at least partially on the distance determined, the remaining travel time determined, a speed measured value specifying the speed of the rail vehicle and predefined coasting data corresponding to coasting behavior of the rail vehicle when the drive is deactivated, starting from the deactivation time the rail vehicle reaches the stopping point according to the timetable, and an output device which is connected to the computing unit, generate a deactivation signal which specifies the deactivation time, wherein the device has a data input at which a timetable modification variable can be input into the device, and the computing unit is configured such that, when a timetable modification variable is input, a modified timetable is formed using the predefined, stored timetable and the timetable modification variable and determines the travel time remaining and the deactivation time based at least partially on the modified timetable, and the computing unit is configured such that it forms the modified

timetable by adding the timetable modification variable to each predefined time information item of the stored timetable.

In another aspect of the invention, the computing unit is configured such that it determines the deactivation time while taking into account a predefined braking profile and a predefined minimum speed, during a downward transgression of which the rail vehicle is braked, driving travel toward the stopping point, in accordance with the predefined braking profile.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a device of the present invention used for a rail vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention relates to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the next stopping point. The device uses a measured location measured value specifying the location of the rail vehicle. Predefined, stored route data determines the remaining time to the next stopping point using a measured time measured value specifying the respective time. A predefined, stored timetable is also used to calculate a deactivation time, taking into account the distance value which is determined, the remaining travel time which is determined, a speed measured value which specifies the speed of the rail vehicle and predefined coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated, starting from which deactivation time the rail vehicle promptly reaches, in a non-driven fashion, the next stopping point which is provided according to the timetable, while complying with the timetable, and an output device which is connected to the control unit, is actuated by it and generates a deactivation signal specifying the deactivation time.

Please replace the consecutive paragraphs beginning at line 30 of page 2 with the following rewritten paragraphs:

The invention discloses a device such that a reliable saving in travel energy can be achieved with it even when there are operating faults.

The invention has a data input at which a timetable modification variable can be input into the device, and the control unit is configured in such a way that, if a timetable modification variable is input, it forms a modified timetable with the predefined, stored timetable and the timetable modification variable which is input, and forms the remaining travel time and the deactivation time taking into account the modified timetable instead of the stored timetable.

An advantage of the device according to the invention is that the correct time is specified for switching off the drive, even if it is not possible to comply with the timetable owing to operational faults. For example, faults such as track faults such as "congestion" on the route or in the case of failures of vehicles etc. The device according to the invention has, in contrast to the known device, a data input at which a timetable modification variable can be input into the device. As a result, when there are operational faults, it is possible, for example, for timetable modifications to be input to the device by a track-mounted device, for example by radio. In order to process the timetable modification variable, the control unit of the device is configured such that it forms a modified timetable with the predefined stored timetable and the timetable modification variable which is input. The remaining travel time and the deactivation time of the drive are formed, taking into account the modified timetable. The device takes into account changes in the timetable by feeding into the device a corresponding timetable modification variable. Hence, in contrast to the known device, a

saving in travel energy can be reliably obtained with the device even when there are operational faults.

Another advantage of the device is that, in order to input the changes in the timetable, only one timetable modification variable has to be input into the device. It is therefore not necessary to transmit a complete new timetable to the rail vehicle or to the device according to the invention.

This will now be explained with reference to an example. If a fault has occurred on a route – for example as a result of congestion on the route – the originally stored timetable can, under certain circumstances, no longer be complied with and it must be replaced by a new timetable. Because a timetable comprises a multiplicity of data, and thus a large quantity of data, this large quantity of data would generally have to be transmitted to the rail vehicle so that the device or the control unit can determine the deactivation time of the drive taking into account this new timetable. In the device according to the invention, the transmission of a complete new timetable data record is, however, not necessary because only a timetable modification variable has to be transmitted to the device. If it is possible to calculate at the track end – for example in the case of congestion – that the timetable is shifted by a total of approximately $\Delta t = +10$ minutes, a track-mounted device is used, for example, to merely transmit a timetable modification variable of $\Delta t = +10$ minutes to the rail vehicle or to the device. A modified timetable is then formed in the device or in the control unit using the predefined, permanently stored timetable and the timetable modification variable of $\Delta t = +10$ minutes. The remaining travel time and the deactivation time for the drive is then formed in the control unit taking into account this modified timetable.

The modified timetable can be formed in the control unit by adding the timetable modification variable to each individual predefined time information item of the stored timetable. The timetable modification variable is added with the correct sign to the respective

predefined time information item of the stored timetable, ensuring that both changes to the timetable which bring about a prolongation of the travel time and changes to the timetable which cause a reduction in the travel time can be taken into account. This is significant, for example, if, contrary to the information specified in the stored timetable, the rail vehicle is to reach the next stopping point earlier than originally provided so that the route may be cleared earlier than planned.

In order to achieve overall short travel times of the rail vehicle, it is generally necessary to avoid the rail vehicle coming to a standstill by coasting to the stopping point. Coasting at a very low speed can, under certain circumstances, take a long time. For this reason, the rail vehicle is generally braked according to a predefined braking profile when it reaches a minimum speed. In order to allow for this, according to one aspect of the device according to the invention, there is provision for the control unit to be configured such that it determines the deactivation time while taking into account a predefined braking profile and a predefined minimum speed, on whose downward transgression the rail vehicle is braked in the phase of the non-driven travel toward the next stopping point in accordance with the predefined braking profile.

Figure 1 shows a device 5 for a rail vehicle (not illustrated) with a control unit 10 which is connected by its one input E10A to a measuring device 15. The measuring device 15 can be, for example, an odometer which determines the respective speed of the rail vehicle and the distance which has already been respectively covered, and thus the respective location S of the rail vehicle, using the revolutions of the wheels of the rail vehicle. At another input E10B of the control unit 10, a timer in the form of a clock 20 which transmits the respective time t as a time measured value to the control unit 10 is arranged upstream of the control unit 10.

An additional input E10C of the control unit 10 is connected to storage 25 in which route data and a binding timetable for the rail vehicle are permanently stored. Furthermore, coasting data AD which describe the coasting behavior of the rail vehicle when the drive is deactivated are stored in the storage 25. This coasting data AD can be, for example, deceleration values which have been measured in advance when the rail vehicle coasts, that is to say when the drive is deactivated.

Please replace the consecutive paragraphs beginning at line 38 of page 6 with the following rewritten paragraphs:

The measuring device 15 and the clock 20 are interrogated with the control unit 10. A location measured value S specifying the respective location of the rail vehicle, a speed measured variable V specifying the respective speed of the rail vehicle and a time measured value t specifying the respective time are transmitted to the control unit 10 here.

The control unit 10 subsequently reads the location S0 of the next stopping point and a scheduled arrival time t0 from the storage 25 as route information or route data. The scheduled arrival time t0 specifies here the time at which the rail vehicle should have reached the next stopping point. In addition, the control unit 10 interrogates the coasting data AD stored in the storage 25.

The control unit 10 then tests whether a timetable modification variable Δt is present at its supplementary input E10D. The application of a timetable modification variable Δt to the supplementary input E10D can be carried out in different ways, with the result that the supplementary input E10D can be configured, for example, in such a way that a timetable modification variable Δt can be made electrically by means of a keypad input of the vehicle driver. Another method of inputting the timetable modification variable Δt could be for the timetable modification variable Δt to be fed into the computing unit 10 by radio – for

example by means of a track-mounted device. This would then of course require corresponding receiving antennas at the supplementary input E10D of the computing unit.

Please replace the consecutive paragraphs beginning at line 38 of page 7 with the following rewritten paragraphs:

The control unit 10 subsequently forms a modified timetable by adding the timetable modification variable $\Delta t = +10$ minutes to each individual predefined timetable information item stored in the storage 25. This addition will now be explained by reference to the example of the scheduled arrival time t0, with which a modified scheduled arrival time t0' is formed according to:

$t0' = t0 + \Delta t$

Then, this modified scheduled arrival time t0', the location measured value S, the location S0 of the next stopping point, the speed V and the coasting data AD of the rail vehicle are used to determine a deactivation time from which the rail vehicle reaches the next stopping point with the drive deactivated by using its kinetic energy and while keeping to the modified timetable.

In order to achieve short travel times of the rail vehicle overall, it is generally necessary to avoid the rail vehicle coming to a standstill at the stopping point as a result of coasting. Under certain circumstances, coasting can take a long time at very low speeds. For this reason, the rail vehicle is generally braked in accordance with a predefined braking profile when a predefined minimum speed is downwardly transgressed. In order to allow for this fact, it is also possible to provide for the deactivation time in the computing unit 10 to be determined while additionally taking into account the predefined braking profile and the predetermined minimum speed.

The way in which the deactivation time can be determined using these input parameters – that is to say the scheduled arrival time t0', the location measured value S, the location S0 over the next stopping point, the speed V and the coasting data AD as well as, if appropriate, a possibly predefined minimum speed and a possibly predefined braking profile – can be found in detail in US patent 5,239,472.

After the deactivation time has been determined, the control device 10 forms an actuation signal ST for the output device 30. The output device 30 then generates a deactivation signal which specifies the deactivation time. This deactivation signal can be, for example as described in the known device, a visual display which signals, by displaying the term "coast" that the coasting can be started. It can also be a display which displays or indicates the deactivation time visually and/or audibly in the form of time information.

In the Claims:

What is claimed is:

1. (Amended) A device of a rail vehicle, comprising:

a computing unit which determines, in the rail vehicle, the distance between the rail vehicle and a stopping point using a measured location measuring value that specifies a location of the rail vehicle and predefined, stored route data remaining travel time to the stopping point using a measured time measuring value which specifies the time and a predefined stored timetable, and a deactivation time in the rail vehicle based at least partially on the distance determined, the remaining travel time determined, a speed measured value specifying the speed of the rail vehicle and predefined coasting data corresponding to the coasting behavior of the rail vehicle when the drive is deactivated, starting from the deactivation time the rail vehicle reaches the stopping point according to the timetable; and

REMARKS

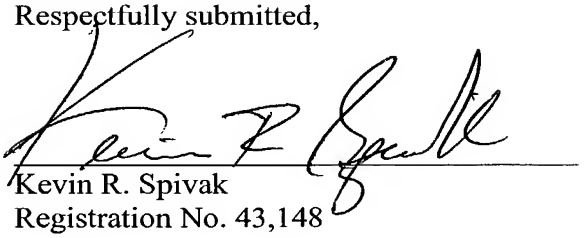
The above amendments to the specification, claims, and abstract have been made to place the application in proper U.S. format and to conform with proper grammatical and idiomatic English. None of the amendments herein are made for reasons related to patentability. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**".

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 449122014700. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Respectfully submitted,

Dated: July 31, 2002

By: 

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Facsimile: (202) 263-8396

an output device which is connected to the computing unit, generate a deactivation signal which specifies the deactivation time, wherein the device has a data input at which a timetable modification variable can be input into the device, and

the computing unit is configured such that, when a timetable modification variable is input, a modified timetable is formed using the predefined, stored timetable and the timetable modification variable and determines the travel time remaining and the deactivation time based at least partially on the modified timetable, and

the computing unit is configured such that it forms the modified timetable by adding the timetable modification variable to each predefined time information item of the stored timetable.

2. (Amended) The device as claimed in claim 1, wherein the computing unit is configured such that it determines the deactivation time while taking into account a predefined braking profile and a predefined minimum speed, during a downward transgression of which the rail vehicle is braked, driving travel toward the stopping point, in accordance with the predefined braking profile.

In the Abstract:

Please replace the Abstract with the substitute Abstract attached hereto.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

For the convenience of the Examiner, the changes made are shown below with deleted text in strikethrough and added text in underline.

In the Specification:

Page 1 before the first paragraph, please delete the following:

~~Description~~

Page 1, between lines 4 and 5, please insert the following headings and paragraph:

CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/02429 which was published in the German language on July 18, 2000.

TECHNICAL FIELD OF THE INVENTION

Please replace the paragraph beginning at line 5 of page 1 with the following rewritten paragraph:

The invention relates to a device for a rail vehicle, and in particular, to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the ~~respectively provided,~~ next stopping point. ~~using a measured location measured value specifying the location of the rail vehicle and predefined, stored route data, determines the remaining time to the next stopping point using a measured time measured value specifying the respective time, and a predefined, stored timetable, and calculates a deactivation time taking into account the distance value which is determined, the remaining travel time which is determined, a speed measured value which specifies the speed of the rail vehicle and predefined coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated, starting from which deactivation time the rail~~

~~vehicle promptly reaches, in a non-driven fashion, the next stopping point which is respectively provided according to the timetable, while complying with the timetable, and an output device which is connected to the control unit, is actuated by it and generates a deactivation signal specifying the deactivation time.~~

Page 1, between lines 28 and 29, please insert the following heading:

BACKGROUND OF THE INVENTION

Please replace the consecutive paragraphs beginning at line 29 of page 1 with the following rewritten paragraphs:

~~Such a~~A device, ~~is known from~~ described in US patent 5,239,472, ~~and~~ is used to ~~make a saving~~ save ~~in~~ travel energy on rail vehicles. This device has, as a control unit, a microprocessor which determines the distance between the rail vehicle and the ~~respective~~ next stopping point with a location measured value which is sensed by an odometer and with route data which is stored in storage means.

Furthermore, the microprocessor determines, with a measured time measured value which indicates the respective time, and with a predefined, stored timetable, the travel time remaining to the rail vehicle until it reaches the next stopping point. With the distance value and the remaining travel time, the microprocessor then calculates, while taking into account the respective travel speed and the coasting behavior of the rail vehicle, ~~that~~ the point in time (referred to below as deactivation time) -- starting from which the rail vehicle can reach the ~~respective~~ next stopping point in non-driven fashion ~~-- that is to say~~ (i.e., by coasting or ~~in a braked fashion --~~ braking), while complying with the timetable.

An output device in the form of a display device is connected to the control unit. The display device is actuated by the control unit ~~in such a way~~ such that displaying the term

"coast" ~~it~~ signals ~~from which~~ a time which the drive of the rail vehicle can be switched off. In the ~~previously known~~ device, the route data and the predefined timetable are transmitted to the rail vehicle by a track-mounted computing unit before the rail vehicle is put into operation, and are permanently stored in said computing unit. The ~~previously known~~ device is therefore~~, in summary,~~ an energy-saving device which ~~indicates from~~ saves energy by determining at what time the next stopping point can be reached in accordance with ~~the~~ a timetable, and places the rail vehicle in a non-driven ~~fashion and thus without consuming energy~~ mode by utilizing the respective kinetic energy of the rail vehicle.

Page 2, between lines 29 and 30, please insert the following headings and paragraphs:

SUMMARY OF THE INVENTION

In one embodiment of the invention, there is a device of a rail vehicle. The device includes, for example, a computing unit which determines, in the rail vehicle, the distance between the rail vehicle and a stopping point using a measured location measuring value that specifies the location of the rail vehicle and predefined, stored route data, remaining travel time to the stopping point using a measured time measuring value which specifies the time and a predefined stored timetable, and a deactivation time in the rail vehicle based at least partially on the distance determined, the remaining travel time determined, a speed measured value specifying the speed of the rail vehicle and predefined coasting data which describes the coasting behavior of the rail vehicle when the drive is deactivated, starting from the deactivation time the rail vehicle reaches in a non-driven fashion the stopping point according to the timetable, and an output device which is connected to the computing unit, generate a deactivation signal which specifies the deactivation time, wherein the device has a data input at which a timetable modification variable can be input into the device, and the computing unit is configured such that, when a timetable modification variable is input, a modified

timetable is formed using the predefined, stored timetable and the timetable modification variable and determines the travel time remaining and the deactivation time based at least partially on the modified timetable, and the computing unit is configured such that it forms the modified timetable by adding the timetable modification variable to each predefined time information item of the stored timetable.

In another aspect of the invention, the computing unit is configured such that it determines the deactivation time while taking into account a predefined braking profile and a predefined minimum speed, during a downward transgression of which the rail vehicle is braked, in a phase of the non-driven travel toward the stopping point, in accordance with the predefined braking profile.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a device of the present invention used for a rail vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention relates to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the next stopping point. The device uses a measured location measured value specifying the location of the rail vehicle. Predefined, stored route data determines the remaining time to the next stopping point using a measured time measured value specifying the respective time. A predefined, stored timetable is also used to calculate a deactivation time, taking into account the distance value which is determined, the remaining travel time which is determined, a speed measured value which specifies the speed of the rail vehicle and predefined coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated, starting from which deactivation time the rail vehicle promptly reaches, in a non-driven fashion, the next

stopping point which is provided according to the timetable, while complying with the timetable, and an output device which is connected to the control unit, is actuated by it and generates a deactivation signal specifying the deactivation time.

Please replace the consecutive paragraphs beginning at line 30 of page 2 with the following rewritten paragraphs:

The invention ~~is based on the object of developing~~ discloses a device ~~of the type described at the beginning in such a way~~ such that a reliable saving in travel energy can be achieved with it even when there are operating faults.

~~This object is achieved according to the invention with a device of the type described at the beginning by virtue of the fact that t~~The invention has a data input at which a timetable modification variable can be input into the device, and the control unit is configured in such a way that, if a timetable modification variable is input, it forms a modified timetable with the predefined, stored timetable and the timetable modification variable which is input, and forms the remaining travel time and the deactivation time taking into account the modified timetable instead of the stored timetable.

An ~~essential~~ advantage of the device according to the invention is that the ~~latter also reliably specifies~~ correct time is specified for ~~the~~ switching off ~~of~~ the drive, even if it is not possible to comply with the timetable owing to operational faults ~~for~~. For example, ~~in the case of~~ faults such as track faults such as "congestion" on the route or in the case of failures of vehicles etc. The device according to the invention ~~specifically~~ has, in contrast to the ~~previously~~ known device, a data input at which a timetable modification variable can be input into the device ~~according to the invention with the result that~~. As a result, when there are operational faults, it is possible, for example, for timetable modifications to be input to the device by a track-mounted device, for example by radio. In order to process ~~this~~ the timetable

modification variable, the control unit of the device ~~according to the invention~~ is configured ~~in such a way~~ such that it forms a modified timetable with the predefined stored timetable and the timetable modification variable which is input ~~and forms the~~. The remaining travel time and the deactivation time of the drive are formed, taking into account ~~this~~ the modified timetable. ~~In summary, with t~~The device ~~according to the invention it is therefore possible to~~ takes into account changes in the timetable by feeding into the device a corresponding timetable modification variable ~~so that~~. Hence, in contrast to the ~~previously~~ known device, a saving in travel energy can be reliably obtained with the device ~~according to the invention~~ even when there are operational faults.

Another ~~A further significant~~ advantage of the device ~~according to the invention~~ is that, in order to input the changes in the timetable, only one timetable modification variable has to be input into the device~~; it~~. It is therefore not necessary to transmit a complete new timetable to the rail vehicle or to the device according to the invention.

This will now be explained with reference to an example~~: if~~. If a fault has occurred on a route – for example as a result of congestion on the route – the originally stored timetable can, under certain circumstances, no longer be complied with and it must be replaced by a new timetable. Because a timetable comprises a multiplicity of data, and thus a large quantity of data, this large quantity of data would generally have to be transmitted to the rail vehicle so that the device or the control unit can determine the deactivation time of the drive taking into account this new timetable. In the device according to the invention, the transmission of a complete new timetable data record is, however, not necessary because ~~with the device according to the invention~~ only a timetable modification variable has to be transmitted to the device. If it is possible to calculate at the track end – for example in the case of congestion – that the timetable is shifted by a total of approximately $\Delta t = +10$ minutes, a track-mounted device is used, for example, to merely transmit a timetable

modification variable of $\Delta t = +10$ minutes to the rail vehicle or to the device~~, according to the invention, and~~. A modified timetable is then formed in the device or in the control unit using the predefined, permanently stored timetable and the timetable modification variable of $\Delta t = +10$ minutes. The remaining travel time and the deactivation time for the drive is then formed in the control unit taking into account this modified timetable.

The modified timetable can be ~~particularly easily~~ formed in the control unit by adding the timetable modification variable to each individual predefined time information item of the stored timetable. ~~With this progression of the method according to the invention, t~~The timetable modification variable is added with the correct sign to the respective predefined time information item of the stored timetable~~; this ensures~~, ensuring that both changes to the timetable which bring about a prolongation of the travel time and changes to the timetable which cause a reduction in the travel time can be taken into account~~; this latter case~~,. This is significant, for example, if, contrary to the information specified in the stored timetable, the rail vehicle is to reach the ~~respective~~ next stopping point earlier than originally provided so that the route may be ~~is~~ cleared earlier than planned.

In order to achieve overall short travel times of the rail vehicle, it is generally necessary to avoid the rail vehicle coming to a standstill ~~exclusively~~ by coasting to the stopping point. ~~because specifically c~~Coasting at a very low speed can, under certain circumstances, take a long time. For this reason, the rail vehicle is generally braked according to a predefined braking profile when it reaches a minimum speed. In order to allow for this ~~fact~~, according to one ~~development~~ aspect of the device according to the invention, there is provision for the control unit to be configured ~~in such a way~~ such that it determines the deactivation time while ~~additionally~~ taking into account a predefined braking profile and a predefined minimum speed, on whose downward transgression the rail vehicle is braked in the phase of the non-driven travel toward the next stopping point in accordance with the

predefined braking profile. ~~In order to explain the invention, a figure shows an exemplary embodiment of a device according to the invention.~~

~~The f~~Figure 1 shows a device 5 for a rail vehicle (not illustrated) with a control unit 10 which is connected by its one input E10A to a measuring device 15. The measuring device 15 can be, for example, ~~what is referred to as~~ an odometer which determines the respective speed of the rail vehicle and the distance which has already been respectively covered, and thus the respective location S of the rail vehicle, using the revolutions of the wheels of the rail vehicle. At ~~further~~ another input E10B of the control unit 10, a timer in the form of a clock 20 which transmits the respective time t as a time measured value to the control unit 10 is arranged upstream of the control unit 10.

An additional input E10C of the control unit 10 is connected to ~~a~~-storage ~~means~~ 25 in which route data and a binding timetable for the rail vehicle are permanently stored. Furthermore, coasting data AD which describe the coasting behavior of the rail vehicle when the drive is deactivated are stored in the storage ~~means~~ 25~~; this~~. This coasting data AD can be, for example, deceleration values which have been measured in advance when the rail vehicle coasts, that is to say when the drive is deactivated.

Please replace the consecutive paragraphs beginning at line 38 of page 6 with the following rewritten paragraphs:

~~Finally t~~The measuring device 15 and the clock 20 are interrogated with the control unit 10~~; a~~. A location measured value S specifying the respective location of the rail vehicle, a speed measured variable V specifying the respective speed of the rail vehicle and a time measured value t specifying the respective time are transmitted to the control unit 10 here.

The control unit 10 subsequently reads the location S0 of the ~~respective~~ next stopping point and a scheduled arrival time t0 from the storage ~~means~~ 25 as route information or route

data~~; the~~. The scheduled arrival time t0 specifies here the time at which the rail vehicle should have reached the ~~respective~~ next stopping point. In addition, the control unit 10 interrogates the coasting data AD stored in the storage ~~means~~ 25.

The control unit 10 then tests whether a timetable modification variable Δt is present at its supplementary input E10D. The application of a timetable modification variable Δt to the supplementary input E10D can be carried out in different ways, with the result that the supplementary input E10D can be configured, for example, in such a way that a timetable modification variable Δt can be made electrically by means of a keypad input of the vehicle driver. Another method of inputting the timetable modification variable Δt could be for the timetable modification variable Δt to be fed into the computing unit 10 by radio – for example by means of a track-mounted device~~; this~~. This would then of course require corresponding receiving antennas at the supplementary input E10D of the computing unit.

Please replace the consecutive paragraphs beginning at line 38 of page 7 with the following rewritten paragraphs:

The control unit 10 subsequently forms a modified timetable by adding the timetable modification variable Δt = + 10 minutes to each individual predefined timetable information item stored in the storage ~~means~~ 25~~; this~~. This addition will now be explained by reference to the example of the scheduled arrival time t0, with which a modified scheduled arrival time t0' is formed according to:

$t0' = t0 + \Delta t$

Then, this modified scheduled arrival time t0', the location measured value S, the location S0 of the next stopping point, the speed V and the coasting data AD of the rail vehicle are used to determine a deactivation time from which the rail vehicle reaches the next stopping point

with the drive deactivated by using its kinetic energy and while keeping to the modified timetable.

In order to achieve short travel times of the rail vehicle overall, it is generally necessary to avoid the rail vehicle coming to a standstill at the stopping point ~~exclusively~~ as a result of coasting ~~because specifically under~~. Under certain circumstances, ~~the~~ coasting can take a long time at very low speeds. For this reason, the rail vehicle is generally braked in accordance with a predefined braking profile when a predefined minimum speed is downwardly transgressed. In order to allow for this fact, it is also possible to provide for the deactivation time in the computing unit 10 to be determined while additionally taking into account the predefined braking profile and the predetermined minimum speed.

The way in which the deactivation time can be determined using these input parameters – that is to say the scheduled arrival time t0', the location measured value S, the location S0 over the next stopping point, the speed V and the coasting data AD as well as, if appropriate, a possibly predefined minimum speed and a possibly predefined braking profile – can be found in detail in US patent 5,239,472 ~~mentioned at the beginning; the content of this US patent 5,239,472 is therefore a component of this description~~.

After the deactivation time has been determined, the control device 10 forms an actuation signal ST for the output device 30 ~~the~~. The output device 30 then generates a deactivation signal which specifies the deactivation time. This deactivation signal can be, for example as described in the ~~previously~~ known device, ~~explained at the beginning~~ a visual display which signals, by displaying the term "coast" that the coasting can be started~~; instead it~~. It can also be a display which displays or indicates the deactivation time visually and/or audibly in the form of time information.

In the Claims:

~~Patent Claims~~

What is claimed is:

1. (Amended) A device ~~(5)~~ of a rail vehicle ~~having~~, comprising:

a computing unit ~~(10)~~ which determines, in the rail vehicle, the distance between the rail vehicle and ~~the respectively provided, next~~ a stopping point using a measured location measuring value ~~(S) specifying the~~ that specifies a the location of the rail vehicle and predefined, stored route data~~, determines the remaining~~ travel time remaining ~~up~~ to the ~~next~~ stopping point using a measured time measuring value ~~(t)~~ which specifies the ~~respective~~ time and a predefined stored timetable, and ~~determines~~ a deactivation time in the rail vehicle ~~taking account of~~ based at least partially on the distance determined, the remaining travel time determined, a speed measured value ~~(v)~~ specifying the speed of the rail vehicle and predefined coasting data ~~(AD) which describe the~~ corresponding to coasting behavior of the rail vehicle when the drive is deactivated, starting from ~~which~~ the deactivation time the rail vehicle ~~promptly~~ reaches ~~in a non-driven fashion~~ the ~~next~~ stopping point ~~respectively provided~~ according to the timetable~~, while keeping to the timetable,~~; and

an output device ~~(30)~~ which is connected to the computing unit ~~(10)~~, ~~is actuated thereby and~~ to generates a deactivation signal which specifies the deactivation time, ~~characterized in that~~ wherein the device ~~(5)~~ has a data input ~~(E5)~~ at which a timetable modification variable ~~(At)~~ can be input into the device ~~(5)~~, and

the computing unit ~~(10)~~ is configured ~~in such a way~~ such that, ~~if~~ when a timetable modification variable ~~(At)~~ is input, a modified timetable is formed using ~~it forms with~~ the predefined, stored timetable and the timetable modification variable ~~(At) which is input, a modified timetable~~ and determines the ~~remaining~~ travel time remaining and the deactivation time ~~taking into account this~~ based at least partially on the modified timetable, and

the computing unit ~~(10) being~~ is configured ~~in such a way~~ such that it forms the modified timetable by adding the timetable modification variable ~~(~~Δt~~)~~ to each predefined time information item of the stored timetable.

2. (Amended) The device as claimed in claim 1, ~~characterized in that~~ wherein the computing unit ~~(10)~~ is configured ~~in such a way~~ such that it determines the deactivation time while ~~additionally~~ taking into account a predefined braking profile and a predefined minimum speed, ~~in the event of the~~ during a downward transgression of which the rail vehicle is braked, ~~in the phase of the non-driven~~ driving travel toward the ~~next~~ stopping point, in accordance with the predefined braking profile.

In the Abstract:

Please replace the Abstract with the substitute Abstract attached hereto.

ENERGY-SAVING DEVICE FOR A RAIL VEHICLE

Abstract

The invention relates to a device for a rail vehicle having a control unit which calculates a deactivation time starting from which the rail vehicle reaches a stopping point which is provided according to the timetable, while keeping to the timetable, using a location measuring value specifying the location of the rail vehicle, stored route data, a measured time value specifying the respective time, a stored timetable, a speed measured value specifying the speed of the rail vehicle and coasting data which correspond to the coasting behavior of the rail vehicle when the drive is deactivated. In order to save travel energy when there are operating faults, the invention provides for the device to have a data input at which a timetable modification variable can be input into the device, and that the control unit is configured such that it forms the deactivation time taking into account this timetable modification variable.

Description

ENERGY-SAVING DEVICE FOR A RAIL VEHICLE

The invention relates to a device for a rail vehicle having a control unit which determines a distance value specifying the distance of the rail vehicle from the respectively provided, next stopping point using a measured location measured value specifying the location of the rail vehicle and predefined, stored route data, determines the remaining time to the next stopping point using a measured time measured value specifying the respective time, and a predefined, stored timetable, and calculates a deactivation time taking into account the distance value which is determined, the remaining travel time which is determined, a speed measured value which specifies the speed of the rail vehicle and predefined coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated, starting from which deactivation time the rail vehicle promptly reaches, in a non-driven fashion, the next stopping point which is respectively provided according to the timetable, while complying with the timetable, and an output device which is connected to the control unit, is actuated by it and generates a deactivation signal specifying the deactivation time.

Such a device is known from US patent 5,239,472 and is used to make a saving in travel energy on rail vehicles. This device has, as control unit, a microprocessor which determines the distance between the rail vehicle and the respective next stopping point with a location measured value which is sensed by an odometer and with route data which is stored in storage means.

Furthermore, the microprocessor determines, with a

measured time measured value which indicates the respective time, and with a predefined, stored timetable, the travel time remaining to the rail vehicle until it reaches the next stopping point. With the distance value and the remaining travel time, the microprocessor then calculates, while taking into account the respective travel speed and the coasting behavior of the rail vehicle, that point in time (referred to below as deactivation time) - starting from which the rail vehicle can reach the respective next stopping point in non-driven fashion - that is to say by coasting or in a braked fashion - while complying with the timetable. An output device in the form of a display device is connected to the control unit. The display device is actuated by the control unit in such a way that by displaying the term "coast" it signals from which time the drive of the rail vehicle can be switched off. In the previously known device, the route data and the predefined timetable are transmitted to the rail vehicle by a track-mounted computing unit before the rail vehicle is put into operation, and are permanently stored in said computing unit. The previously known device is therefore, in summary, an energy-saving device which indicates from what time the next stopping point can be reached in accordance with the timetable in a non-driven fashion and thus without consuming energy by utilizing the respective kinetic energy of the rail vehicle.

The invention is based on the object of developing a device of the type described at the beginning in such a way that a reliable saving in travel energy can be achieved with it even when there are operating faults.

This object is achieved according to the invention with a device of the type described at the beginning by virtue of the fact that the invention has a data input at which a timetable modification variable can be input

into the device, and the control unit is configured in such a way that, if a timetable modification variable is input, it forms a modified timetable with the predefined, stored timetable and the timetable modification variable which is input, and forms the remaining travel time and the deactivation time taking into account the modified timetable instead of the stored timetable.

An essential advantage of the device according to the invention is that the latter also reliably specifies the correct time for the switching off of the drive even if it is not possible to comply with the timetable owing to operational faults - for example in the case of track faults such as "congestion" on the route or in the case of failures of vehicles etc. The device according to the invention specifically has, in contrast to the previously known device, a data input at which a timetable modification variable can be input into the device according to the invention with the result that when there are operational faults, it is possible, for example, for timetable modifications to be input to the device by a track-mounted device, for example by radio. In order to process this timetable modification variable, the control unit of the device according to the invention is configured in such a way that it forms a modified timetable with the predefined stored timetable and the timetable modification variable which is input, and forms the remaining travel time and the deactivation time of the drive taking into account this modified timetable. In summary, with the device according to the invention it is therefore possible to take into account changes in the timetable by feeding into the device a corresponding timetable modification variable so that, in contrast to the previously known device, a saving in travel energy can be reliably obtained with the device according to the invention even when there are operational faults. A

further significant advantage of the device according to the invention is that, in order to input the changes in the timetable, only one timetable modification variable has to be input into the device; it is therefore not necessary to transmit a complete new timetable to the rail vehicle or to the device according to the invention. This will be explained with reference to an example: if a fault has occurred on a route - for example as a result of congestion on the route - the originally stored timetable can, under certain circumstances, no longer be complied with and it must be replaced by a new timetable. Because a timetable comprises a multiplicity of data, and thus a large quantity of data, this large quantity of data would generally have to be transmitted to the rail vehicle so that the device or the control unit can determine the deactivation time of the drive taking into account this new timetable. In the device according to the invention, the transmission of a complete new timetable data record is, however, not necessary because with the device according to the invention only a timetable modification variable has to be transmitted to the device. If it is possible to calculate at the track end - for example in the case of congestion - that the timetable is shifted by a total of approximately $\Delta t = +10$ minutes, a track-mounted device is used, for example, to merely transmit a timetable modification variable of $\Delta t = +10$ minutes to the rail vehicle or to the device according to the invention, and a modified timetable is formed in the device or in the control unit using the predefined, permanently stored timetable and the timetable modification variable of $\Delta t = +10$ minutes. The remaining travel time and the deactivation time for the drive is then formed in the control unit taking into account this modified timetable.

The modified timetable can be particularly easily

formed in the control unit by adding the timetable modification variable to each individual predefined time information item of the stored timetable. With this progression of the method according to the invention, the timetable modification variable is added with the correct sign to the respective predefined time information item of the stored timetable; this ensures that both changes to the timetable which bring about a prolongation of the travel time and changes to the timetable which cause a reduction in the travel time can be taken into account; this latter case is significant, for example, if, contrary to the information specified in the stored timetable, the rail vehicle is to reach the respective next stopping point earlier than originally provided so that the route is cleared earlier than planned.

In order to achieve overall short travel times of the rail vehicle, it is generally necessary to avoid the rail vehicle coming to a standstill exclusively by coasting to the stopping point because specifically coasting at a very low speed can, under certain circumstances, take a long time. For this reason, the rail vehicle is generally braked according to a predefined braking profile when it reaches a minimum speed. In order to allow for this fact, according to one development of the device according to the invention there is provision for the control unit to be configured in such a way that it determines the deactivation time while additionally taking into account a predefined braking profile and a predefined minimum speed, on whose downward transgression the rail vehicle is braked in the phase of the non-driven travel toward the next stopping point in accordance with the predefined braking profile. In order to explain the invention, a figure shows an exemplary embodiment of a device according to the invention.

The figure shows a device 5 for a rail vehicle (not illustrated) with a control unit 10 which is connected by its one input E10A to a measuring device 15. The measuring device 15 can be, for example, what is referred to as an odometer which determines the respective speed of the rail vehicle and the distance which has already been respectively covered, and thus the respective location S of the rail vehicle, using the revolutions of the wheels of the rail vehicle. At a further input E10B of the control unit 10, a timer in the form of a clock 20 which transmits the respective time t as a time measured value to the control unit 10 is arranged upstream of the control unit 10.

An additional input E10C of the control unit 10 is connected to a storage means 25 in which route data and a binding timetable for the rail vehicle are permanently stored. Furthermore, coasting data AD which describe the coasting behavior of the rail vehicle when the drive is deactivated are stored in the storage means 25; this coasting data AD can be, for example, deceleration values which have been measured in advance when the rail vehicle coasts, that is to say when the drive is deactivated.

The control unit 10 also has a supplementary input E10D at which a timetable modification variable Δt in the form of a time offset value can be applied to the control unit. The supplementary input E10D of the control unit 10 simultaneously forms a data input E5 of the device 5.

An output device 30 is arranged downstream of the control unit 10 at an output A10.

The device 5 is operated as follows:

Firstly the measuring device 15 and the clock 20 are

interrogated with the control unit 10; a location measured value S specifying the respective location of the rail vehicle, a speed measured variable V specifying the respective speed of the rail vehicle and a time measured value t specifying the respective time are transmitted to the control unit 10 here.

The control unit 10 subsequently reads the location S0 of the respective next stopping point and a scheduled arrival time t0 from the storage means 25 as route information or route data; the scheduled arrival time t0 specifies here the time at which the rail vehicle should have reached the respective next stopping point. In addition, the control unit 10 interrogates the coasting data AD stored in the storage means 25.

The control unit 10 then tests whether a timetable modification variable Δt is present at its supplementary input E10D. The application of a timetable modification variable Δt to the supplementary input E10D can be carried out in different ways, with the result that the supplementary input E10D can be configured, for example, in such a way that a timetable modification variable Δt can be made electrically by means of a keypad input of the vehicle driver. Another method of inputting the timetable modification variable Δt could be for the timetable modification variable Δt to be fed into the computing unit 10 by radio - for example by means of a track-mounted device; this would then of course require corresponding receiving antennas at the supplementary input E10D of the computing unit.

It is assumed below, by way of example, that a timetable modification variable Δt = + 10 minutes is applied to the supplementary input E10D of the control unit 10.

The control unit 10 subsequently forms a modified

timetable by adding the timetable modification variable $\Delta t = + 10$ minutes to each individual predefined timetable information item stored in the storage means 25; this addition will now be explained by reference to the example of the scheduled arrival time t0, with which a modified scheduled arrival time t0' is formed according to:

$$t0' = t0 + \Delta t$$

Then, this modified scheduled arrival time t0', the location measured value S, the location S0 of the next stopping point, the speed V and the coasting data AD of the rail vehicle are used to determine a deactivation time from which the rail vehicle reaches the next stopping point with the drive deactivated by using its kinetic energy and while keeping to the modified timetable.

In order to achieve short travel times of the rail vehicle overall, it is generally necessary to avoid the rail vehicle coming to a standstill at the stopping point exclusively as a result of coasting because specifically under certain circumstances the coasting can take a long time at very low speeds. For this reason, the rail vehicle is generally braked in accordance with a predefined braking profile when a predefined minimum speed is downwardly transgressed. In order to allow for this fact, it is also possible to provide for the deactivation time in the computing unit 10 to be determined while additionally taking into account the predefined braking profile and the predetermined minimum speed.

The way in which the deactivation time can be determined using these input parameters - that is to say the scheduled arrival time t0', the location measured value S, the location S0 over the next

stopping point, the speed V and the coasting data AD as well as, if appropriate, a possibly predefined minimum speed and a possibly predefined braking profile - can be found in detail in US patent 5,239,472 mentioned at the beginning; the content of this US patent 5,239,472 is therefore a component of this description.

After the deactivation time has been determined, the control device 10 forms an actuation signal ST for the output device 30; the output device 30 then generates a deactivation signal which specifies the deactivation time. This deactivation signal can be, for example as in the previously known device explained at the beginning, a visual display which signals, by displaying the term "coast" that the coasting can be started; instead, it can also be a display which displays or indicates the deactivation time visually and/or audibly in the form of time information.

Patent Claims

1. A device (5) of a rail vehicle having
   - a computing unit (10) which determines, in the rail vehicle,
     - the distance between the rail vehicle and the respectively provided, next stopping point using a measured location measuring value (S) specifying the location of the rail vehicle and predefined, stored route data,
     - determines the remaining travel time up to the next stopping point using a measured time measuring value (t) which specifies the respective time and a predefined stored timetable, and
     - determines a deactivation time in the rail vehicle taking account of the distance determined, the remaining travel time determined, a speed measured value (V) specifying the speed of the rail vehicle and predefined coasting data (AD) which describe the coasting behavior of the rail vehicle when the drive is deactivated, starting from which deactivation time the rail vehicle promptly reaches in a non-driven fashion the next stopping point respectively provided according to the timetable, while keeping to the timetable, and
   - an output device (30) which is connected to the computing unit (10), is actuated thereby and generates a deactivation signal which specifies the deactivation time, characterized in that
   - the device (5) has a data input (E5) at which a timetable modification variable (Δt) can be input into the device (5), and
   - the computing unit (10) is configured in such a way that, if a timetable modification variable (Δt) is input,

it forms, with the predefined, stored timetable and the timetable modification variable (Δt) which is input, a modified timetable and

- determines the remaining travel time and the deactivation time taking into account this modified timetable instead of the stored timetable,
- the computing unit (10) being configured in such a way that it forms the modified timetable by adding the timetable modification variable (Δt) to each predefined time information item of the stored timetable

2. The device as claimed in claim 1, characterized in that the computing unit (10) is configured in such a way that it determines the deactivation time while additionally taking into account a predefined braking profile and a predefined minimum speed, in the event of the downward transgression of which the rail vehicle is braked, in the phase of the non-driven travel toward the next stopping point, in accordance with the predefined braking profile.

Abstract

Energy-saving device for a rail vehicle

The invention relates to a device (5) for a rail vehicle having a control unit (10) which calculates a deactivation time starting from which the rail vehicle promptly reaches in a non-driven fashion the next stopping point respectively provided according to the timetable, while keeping to the timetable, using a location measuring value (S) specifying the location of the rail vehicle, stored route data, a measured time value (t) specifying the respective time, a stored timetable, a speed measured value (V) specifying the speed of the rail vehicle and coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated.

In order to be able to reliably save travel energy even when there are operating faults, the invention provides for the device (5) to have a data input (E5) at which a timetable modification variable (Δt) can be input into the device (5), and that the control unit (10) is configured in such a way that it forms the deactivation time taking into account this timetable modification variable (Δt).

Fig.

Abstract

Energy-saving device for a rail vehicle

The invention relates to a device (5) for a rail vehicle having a control unit (10) which calculates a deactivation time starting from which the rail vehicle promptly reaches in a non-driven fashion the next stopping point respectively provided according to the timetable, while keeping to the timetable, using a location measuring value (S) specifying the location of the rail vehicle, stored route data, a measured time value (t) specifying the respective time, a stored timetable, a speed measured value (V) specifying the speed of the rail vehicle and coasting data which describe the coasting behavior of the rail vehicle when the drive is deactivated.

In order to be able to reliably save travel energy even when there are operating faults, the invention provides for the device (5) to have a data input (E5) at which a timetable modification variable (Δt) can be input into the device (5), and that the control unit (10) is configured in such a way that it forms the deactivation time taking into account this timetable modification variable (Δt).

Fig.

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Energiespar-Einrichtung fuer ein Schienenfahrzeug

ENERGY SAVING DEVICE FOR A RAIL VEHICLE

deren Beschreibung

the specification of which

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
☒ am 18 Juli 2000als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/02429
eingereicht wurde und am 29.10.2001
abgeändert wurde (falls tatsächlich abgeändert).

(check one)
☐ is attached hereto.
☒ was filed on 18 July 2000 as
PCT international application
PCT Application No. PCT/DE00/02429
and was amended on 29.10.2001
(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
19935757.9 (Number) (Nummer)	DE (Country) (Land)	1999.07.27 (Day Month Year Filed) (Tag Monat Jahr eingereicht)	☒ Yes Ja	☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja	☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja	☐ No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE/02429 (Application Serial No.) (Anmeldeseriennummer)	18.07.2001 (Filing Date D, M, Y) (Anmeldedatum T, M, J)	anhängig (Status) (patentiert, anhängig, aufgegeben)	Pending (Status) (patented, pending, abandoned)
(Application Serial No) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M; J)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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Postanschrift	Post Office Address

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(Supply similar information and signature for third and subsequent joint inventors).

PATENT
Docket No. 449122014700

CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on October 11, 2002.

Melissa Garton

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Torsten BAIER

Serial No.: 10/031,986

Filing Date: January 25, 2002

For: ENERGY-SAVING DEVICE FOR A RAIL VEHICLE

Examiner: Not yet assigned

Group Art Unit: Not yet assigned

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